July 2006

RESEARCH NEWSLETTER

A Publication from the Maine Department of Transportation's Research Division

Maine DOT - University News

MaineDOT and UMaine have recently completed the following studies.

Red Light Running Photo Enforcement Pilot Project in Lewiston & Auburn

Five signalized intersections in Lewiston and Auburn, Maine were outfitted with photographic equipment in a recent pilot study on red light running deterrence technology. The intent of the pilot study was to demonstrate the extent of red light running in Maine, to show that electronic (photographic) law enforcement can work in Maine's severe winter climate, and to provide information for decision- makers to use in formulating policies regarding electronic law enforcement in Maine. Dr. Per Garder from the University of Maine, Civil engineering Department was responsible for evaluating the performance of the system, using police crash reports, traffic conflict data, video and field observations of driver behavior.

The photo enforcement equipment took photographs of the license plates of vehicles entering the intersection against a red signal. Warning letters were issued to owner of the vehicle captured on the image. No actual citations, summonses, or fines were issued. (Maine law currently does not allow issuing citations based on photographic evidence. Over 4,600 warning letters were issued during the six- month pilot project, resulting in an average of over 5 violations per day for each intersection. Despite the fact that no fines were issued, a decrease in violations over the six month period is reported.

U.S. Route 1 Public Opinion Survey in Warren, Maine; Gauging MaineDOT Performance on Context Sensitive Design

Graduate students from the University of Maine recently completed a public opinion survey about a 2003 Route 1 highway reconstruction project in Warren. The students designed, fielded, and analyzed the survey of 2,540 Warren residents for MaineDOT in a cooperative effort between MaineDOT and the University. The students completed the work as part of a course

in the Master of Public Administration Program.

The Warren project was one of the first where MaineDOT utilized a Context Sensitive Design (CSD) process. The public opinion survey was an important part of the evaluation of this CSD project. The CSD process allows for more flexibility in meeting National Highway System (NHS) standards in the design of the highway and also

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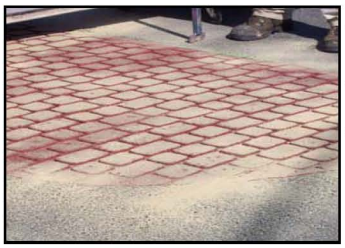
New Products

Hey, wait a minute!!!...what about a few Product Approval highlights?

IMPRINT

Imprint is a hot applied wearing course comprised of a synthetic asphalt based compound, incorporating pigment color, graded rubber granules and granite aggregate, reinforced with metal and glass fibers. This compound is imprinted with a mold while still in a slightly molten state, replicating the appearance of brick or stone paving in a color and pattern. Imprint was used by MaineDOT in 2005 on a project on Route 1 in Damariscotta Maine. Although the methods used in this application were extremely hand labor- intensive, it is possible to place Imprint with a special type of paver on larger scope projects; such as full- lane width paving. Imprint is manufactured by Prismo, an English company and is marketed in the USA by Jarvis- USA. The Transportation Research Division will monitor these initial Imprint installations for durability. For more information on Imprint, please visit their USA website at: Jarvis USA



SNOWPLOWABLE MARKERS

Several types of snowplowable markers are being evaluated on a test deck on I-295 in Scarborough. Three manufacturers agreed to install their products for the test, Avery-Dennison. Hallen, and Ray-o-Lite. After one year of service all of the marker assemblies appear to be in good condition overall in spite of receiving as many as 700 snowplow passes over the course of the previous winter and a high year-round traffic volume.

Most castings show at least moderate wear on upper surface with some scarifying apparent. Light surface rusting, which is to be expected, is also evident. It appears that the units have been impacted by a sideway force, perhaps by plow blades, shearing some "ears" off of the castings. This appears to be typical damage to all brands. These devices will be evaluated for one more season before the results are analyzed.

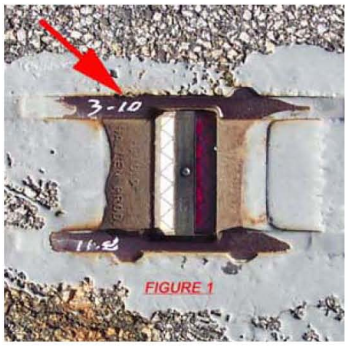


FIGURE 1

RC FLAGMAN

A type of remotely operated traffic flagging device was evaluated recently the Department on a Maintenance project in Litchfield on Route 197. These flagger assistance units allow one person to remotely operate the unit from a safe location, thereby eliminating the need for two flaggers to be in the roadway, near moving traffic. Work zone injuries are a serious safety concern, and these units demonstrated the technology available to reduce the threat of injury in some workzones. MianeDOT intends to continue the testing by trying other vendor's products as well.

Next Issue Features:

- Pavement
- Engineered Filter Berms
- Winter Severity Index
- Statewide Environmental Focus Areas
- Non-Destructive Testing

Intelligent Transportation Systems (ITS)

ITS SYSTEMS ENGINEERING FOR RURAL STATES

On Dec. 14, & 15, Maine DOT hosted a system engineering (SE) workshop where FHWA ITS Headquarters staff from Washington D.C., discussed ways to apply system engineering principles to the types of ITS projects being deployed by rural states. The two- day workshop focused on the development of the Concept of Operation for a rural ITS project. The Concept of Operations is a document that describes stakeholder needs, expectations, the way the system is supposed to operate, and what the system is supposed to do. Documenting these system definition parameters upfront, as part of the planning process, prior to technology identification and implementation, is an essential element of systems engineering. The system engineering process can lead to better, more reliable system deployments. The system engineering requirement is a core requirement of the FHWA rules regarding funding of ITS projects.

ITS STATEWIDE ARCHITECTURE

In 2005 MaineDOT hosted ITS statewide architecture workshops. The workshops, attracted nearly 60 participants from numerous agencies including the Maine State Police, MEMA, the Maine Warden Service, transit and ferry service providers, BIS, the Bureau of Motor Vehicles, the Maine Tourism Association, the Maine Motor Transport Association, Acadia National Park, MPOs, and others. This workshop brought together transportation partners and stakeholders in order to establish the statewide ITS architecture. The architecture serves to ensure ITS is deployed in an integrated and cost- effective manner. The architecture is also required for federal funding. ITS tools and technologies can help fulfill the need for a national system that is both economically sound and environmentally efficient. MaineDOT's Transportation Research Division plays a lead role in developing and maintaining Maine's Statwide ITS Architecture.

Geogrids & Gravel Stabilization Projects

GEOGRID IMPROVES HIGHWAY PERFORMANCE

MaineDOT's Collector Highway Improvement Program (CHIP) attempts to reduce construction costs by utilizing existing roadway base and pavement materials. In the fall of 1998, a CHIP project incorporated geogrids as an experimental treatment. The focus of this research was to determine if placement of a Geogrid product could minimize the need for additional base gravel

materials. During the five year evaluation period, the roadway has performed better than expected. Sections with Geogrid have experienced less cracking, rutting, roughness and increased stability. The cost of utilizing Geogrid amounts to approximately $4.00 per square meter. Based on cost and performance, the use of Geogrid has been a successful addition to the CHIP program.

GRAVEL STABILIZATION METHODS COMPARED

A long- term research project on Route 1 in Van Buren has shown that a modified subbase soil cement mixture using 6 percent of Type 1 Portland Cement has performed better than other treatment options on an experimental reconstruction project. Each of the six experimental sections within this project are performing quite well, however. Having been in service for approximately 14 years, the sections included test portions stabilized with asphalt, or calcium chloride, or with different sized aggregate. Of the four criteria evaluated (Roughness, Rutting, Structural Strength and Cracking), only Structural Strength exhibited a significant statistical difference in any of the sections. Structurally, the Soil Cement section had a significant statistical difference when compared to the other four sections. The Soil Cement section consistently "outperformed" the other sections throughout the evaluation period with respect to Structural Strength. This difference in strength in promising for future projects.

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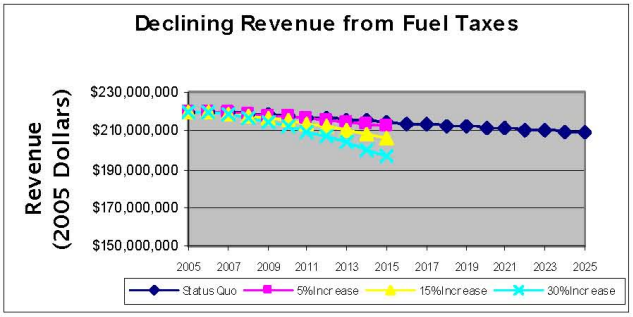
allows for enhanced citizen and stakeholder input.

The survey revealed that nearly 80% of the respondents were in favor of the reconstruction process before it began. Satisfaction with the Route 1 project is high, with 86% of respondents reporting that the project resulted in worthwhile improvements. A slightly smaller number (76%) would be in favor of another section of Route 1 being reconstructed with this design.

Sustainable Transportation Funding for Maine's Future

In 2004, the motor fuel tax was 68% of the Highway Fund revenue. There are threats to the continuing viability of the fuel tax, however, including tighter fuel economy standards, potential increase of alternative fuel and hybrid vehicles and declining purchase power. This recently completed study examined alternatives for funding transportation projects and their suitability for use in Maine.

The study utilized an extensive literature review to identify twelve financing options, many of which are simultaneously aimed at generating revenue and addressing other transportation issues such as congestion. The study also looked at case studies from around the nation. The study culminated in a report and was presented to the Maine Legislative Transportation Committee.



There are four main alternative funding options identified in the report: taxes, road/direct pricing, tolls and fees. The report points out that increasingly, transportation planning must consider not only traditional issues of best practice, financing and safety, but also issues of equity and suitability.

Wood Composite Materials

MaineDOT has completed construction of several demonstration projects utilizing wood- composites materials. Wood composites are lightweight, non-corrosive and have excellent strength properties.

Table 1 - Summary of Composite Material Projects Completed in Maine

Description	Town	Bridge/Facility	Research Cost
FRP Reinforced Glulaminated Deck Panels 2670 sq. ft. 'L' shaped pier	Milbridge	Municipal Pier	$ 246,000
FRP Reinforced Glulaminated Deck Panels 1230 sq. ft. single span	Washington - Union	Skidmore Bridge	$ 270,000
FRP Reinforced Glulaminated Beams 2600 sq. ft. single span	Fairfield	Biotechnical Industrial Park	$ 350,000
FRP Bridge Drains Installed by Bridge Maintenance crews	Winterport Beaver Cove Beaver Cove	Plummer Bridge Beaver Creek Br. South Brook Bridge	$ 18,000
FRP Bridge Drain downspouts	Bath - Woolwich	Sagadahoc Bridge	$ 0
All FRP Floating Deck	Isle Au Haut	Municipal Pier	$ 0

Manufacturing and construction costs, however, along with the lack of American Association of State Highway Transportation Officials (AASHTO) specifications, are impediments to their widespread use. To meet this challenge, MaineDOT continues to work with our partners to make applications more economical. MaineDOT will apply for funding under the Innovative Bridge Research and Deployment

Program, that will ensure continued research and to further work on the most promising projects. The new IBRD program under SAFETEA- LU is a continuation

Table 2 - Summary of Composite Material Projects Underway in Maine

Description	Town	Bridge/Facility	Research Cost
FRP - Wood Temporary Deck Panels	TBD	TBD	$ 210,000
FRP Concrete Arch	TBD	TBD	$ 270,000
FRP Reinforced Glulaminates for Bridge Applications - Design Code	N/A	N/A	$ 883,000
FRP - Glulaminated Post Tensioned Beams	TBD	TBD	$ 500,000
All FRP lightweight bridge deck - 1150 sq. ft. single leaf bascule bridge	South Bristol	The Gut Bridge	$ 400,000
Six (6) - FRP strands for suspension bridge	Prospect - Verona	Waldo-Hancock Bridge	$ 225,000

of a similar one in TEA- 21 and makes $65.5 million available to state DOT's.